

Chapter 1

Course Introduction

Objectives

On completing this chapter, you should be able to:

1. Explain the purpose and content of the NIST training program.
2. Identify the purpose and objectives of this course.
3. Describe the prerequisite knowledge and skills necessary to comprehend the content of the course.
4. Describe how liquefied petroleum gas (LPG) is used in the commercial marketplace and the importance of periodic examinations by weights and measures officials of equipment used in the measurement and delivery of LPG products.

The NIST Training Program

The National Institute of Standards and Technology (NIST) has a mandate to provide technical assistance and advice to promote measurement uniformity and traceability of standards. Historically, training has been part of NIST Weights and Measures Division's (WMD) approach to providing this technical assistance and advice. In addition, NIST implements its statutory responsibility for cooperation with the States to:

- promote inspection and regulatory uniformity, and
- provide weights and measures officials with the knowledge and skills they need to deal with and benefit from changing technologies.

NIST offers a variety of courses and formats to meet the specific training needs of individuals or groups. While some of the courses are designed primarily to provide structured and uniform training for new officials, experienced officials also benefit from continuing education and training. Included among the courses offered by NIST are a series of "functional courses," which provide detailed instruction on specific functions of officials such as inspecting and testing different types of weighing and measuring equipment. Other courses offered cover background, theory, and policy on weights and measures related subjects. The following courses cover topics that are related to specific aspects of this course and may be especially useful either in preparation for your study of liquefied petroleum gas liquid-measuring devices or as supplements:

- "Introduction to NIST Handbook 44, *Specifications, Tolerances and Technical Requirements for Weighing and Measuring Devices*"

- “Introduction to Electronic Weighing and Measuring Systems” (currently under revision)

The Importance Of Testing LPG Liquid-Measuring Devices

LPG liquid products are sold either by weight or, especially at the retail level, by volume. Between the producer and the ultimate consumer, the product may be sold a number of times. At each of these transactions, buyer and seller must rely upon a weighing or measuring device to provide the quantitative basis for determining the final price of the sale. In most instances, there is no means available at the time of sale to check or verify the quantities registered by the scale or meter, and the measurement itself is accomplished by mechanical or electronic means that cannot be directly observed. Because of the number of such transactions, and the large quantity and significant economic impact of the products that change hands in them, the accuracy and reliability of the weighing and measuring devices used for LPG liquid are essential to the marketplace. This training course deals with one important group of these devices--those that are used for commercial measurement of LPG liquid by volume.

More than 8 million homes and 1.5 million farms use LPG for residential and commercial heating and cooling, cooking, lighting, and other applications. In 1997 this represented sales of more than 8.7 billion gallons of LPG. In total, there are more than 20 million retail consumers of LPG. People who live in rural areas may be most aware of the vital role of these products in our national economy since LPG is most widely used in regions where low population density tends to increase distribution costs for natural gas, especially for transportation. Our agricultural economy has come to depend heavily upon LPG products and would be far less productive without them. LPG represents 3 to 4 percent of this country's energy needs, and this percentage is expected to grow significantly in the future as its use as an alternative clean fuel for vehicle increases.

As a weights and measures official, you serve both the purchasing public and the commercial community by assuring equity in the marketplace, discouraging unfair competition, and promoting consumer confidence. The vital role of LPG in our national economy adds great importance to the task of enforcing accurate and fair measurement.

Your job is a challenging one, requiring knowledge, technical skills, judgment, and a high regard for safety. You must master the complexities of the exacting specifications, tolerances, and procedures that have been adopted by your jurisdiction. And you must perform your tasks judiciously, in such a way as to assure the protection of the consuming public and at the same time minimize the burden of inspections and tests on device users.

As you will see in the following chapters, you must also be able to recognize and distinguish between various types and classes of metering devices before you can decide what particular requirements apply in a given situation. And you must also, to do your job well, understand the design and operation of an entire metering system, of which the measuring device is only a part.

Finally, you must keep up to date with a constantly changing and evolving technology. As you are probably aware, the technology revolution continues to bring about significant changes in weighing

and measuring devices. You must, therefore, be prepared to deal with frequent changes in already complex and highly sophisticated systems.

Course Objectives

This training course is intended to help prepare you to take on these challenges. You must understand, however, that the purposes and objectives of this program are necessarily limited. It is not intended to train you as a mechanical or electronic technician, serviceperson, or troubleshooter. Its primary purpose is to help you to perform the important job of a weights and measures inspector.

Upon completion of the course, you should be able to:

- identify and describe the major types of metering systems used for commercial measurement and delivery of LPG liquid;
- describe the design and operation of typical metering systems and their major components, especially those involved in measuring, indicating, recording, and delivering product;
- understand and describe basic safety procedures and equipment, including emergency procedures, employed in examining LPG liquid-measuring systems;
- identify appropriate test equipment used for testing these metering systems in the field and describe procedures for setup, operation, and maintenance of this equipment;
- describe procedures for inspecting LPG metering systems to determine whether they conform with specifications and other requirements set forth in NIST Handbook 44, and in accordance with NIST Handbook 112, “Examination Procedure Outlines for Weighing and Measuring Devices;”
- describe procedures for testing these metering systems in the field to determine whether or not they conform to performance requirements set forth in the latest edition of NIST Handbook 44, “Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices;” and
- describe post-examination tasks that must be performed upon completion of an official field examination, including documentation and recordkeeping.

Prerequisites

No previous knowledge of LPG liquid-measuring systems is required. You should, however, be familiar with the introductory and general sections of the latest edition of NIST Handbook 44, “*Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices,*” before beginning this course.

Summary

This training course is part of the NIST WMD's training program for weights and measures officials. It is intended to help you prepare to perform the important task of examining LPG liquid-measuring systems in the field.